

NASA-CR-200744

**Final Technical Report for
NASA-Ames Research
Center Cooperative Agreement NCC2-286,
Crew Selection and Training**

Robert L. Helmreich, Principal Investigator
Department of Psychology
The University of Texas at Austin
Austin, Texas 78712

The research completed under this Cooperative Agreement over a decade addressed a number of issues relevant to the performance of teams in demanding environments. Initial work, conducted in the aviation analog environment, focused on developing new measures of performance related attitudes and behaviors. The attitude measures were used to assess acceptance of concepts related to effective teamwork and personal capabilities under stress. The behavioral measures were used to evaluate the effectiveness of flight crews operating in commercial aviation.

Assessment of team issues in aviation led further to the evaluation and development of training to enhance team performance. Much of the work addressed evaluation of the effectiveness of such training, which has become known as Crew Resource Management or CRM. The research demonstrated that CRM is effective in changing the attitudes and behavior of crews. It has now been mandated for airlines around the world. During the course of this work, members of the research group worked with more than thirty airlines and with the United States Air Force and Navy to assess the value of such training for military crews. The assessment methods developed as part of the research are now widely used by civil and military organizations around the world. In recognition of the value of the research, the Principal Investigator received the Distinguished Service Award of the Flight Safety Foundation in 1994. In the same year, he received the Laurels Award for the research from *Aviation Week and Space Technology*. One of the conclusions of this research was that the same training approach would be highly applicable to astronauts, especially for crews embarking on long duration flights in the space station.

A second line of investigation was into personality characteristics that predict performance in challenging environments such as aviation and space. A new personality inventory was developed and validating as predicting the performance of pilots in commercial aviation. Several major airlines now use the instrument to screen applicants for pilot positions.

The personality and performance research was also extended to include the astronaut corps and a set of performance measures for astronauts was developed. Both personality characteristics of current astronauts and their performance (rated by peers and leaders) was assessed. Significant relationships between personality and rated performance were isolated. Experimental research into selection was initiated by voluntary, confidential

MAR 22 1996
TO CASI

testing of three cohorts of astronaut candidates. Criterion measures of the performance of selected astronauts have not yet been obtained.

A third line of investigation of team performance grew out of the study of flight crews in different organizations. This led to the development of a theoretical model of crew performance that included not only individual attributes such as personality and ability, but also organizational and national culture. Initial research has focused on measuring the influence of national culture on flight crew attitudes and behavior. A new assessment inventory, the Flight Management Attitudes Questionnaire was developed and preliminary data have been obtained from more than 10,000 pilots in twenty countries including Asia, North and South America, Europe, the Middle East, and Africa. Initial results suggest that national culture strongly influences team behavior, especially in areas related to command and leadership and the use of automation. This research is highly relevant to spaceflight as current and future missions will increasingly be conducted by multi-national crews.

A final line of investigation involved beginning to assess whether the methodologies and measures developed for the aviation analog could be applied to another domain – the performance of medical teams (surgeons, anesthesiologists, and nurses) working in the operating room. Preliminary results suggest that the degree of generality is high.

Dissemination of Research Findings

Results of the research have been widely distributed through publications in the scientific literature, including refereed journals, book chapters, and one edited book. Appendix A lists sixty-eight publications during this period. Many invited addresses to the scientific community were also delivered, along with technical reports for use by related researchers. Appendix B lists selected reports and invited addresses.

Graduate Education

The project has also supported the graduate work of a number of students at the doctoral and masters level. Several of these have continued to work in NASA and other government agencies including the Federal Aviation Administration and the U.S. Air Force following graduation. Appendix C lists individuals and dissertation and thesis titles for six doctorates and two masters' degrees supported by the research project.

Appendix A: Publications Resulting from NASA Cooperative Agreement NCC2-286 February 1, 1984 through June 30, 1995

- Helmreich, R. L. (1984). Cockpit management attitudes. *Human Factors*, 26, 583-589.
- Helmreich, R.L., Foushee, H.C., Benson, R., & Russini, R. (1986). Cockpit management attitudes: Exploring the attitude performance linkage. *Aviation, Space and Environmental Medicine*, 57, 1198-1200.
- Helmreich, R.L. (1986). Pilot selection and performance evaluation: A new look at an old problem. In *Proceedings Psychology in the Department of Defense*, USAFA-TR-86-1, April 16-18, USAF Academy, Colorado Springs, CO, 274-278.
- Wilhelm, J. A. (1986). Considerations in evaluation of cockpit resource management training. In *Proceedings Psychology in the Department of Defense*, USAFA-TR-86-1, April 16-18, USAF Academy, Colorado Springs, CO, 279-283.
- Siem, F. M. (1986). The effects of aircrew member personality on interaction and performance. In *Proceedings Psychology in the Department of Defense*, USAFA-TR-86-1, April 16-18, USAF Academy, Colorado Springs, CO, 284-288.
- Siem, F. M. (1986). Cockpit attitudes and personality in the general aviation community. In *Proceedings of 1st Annual Human Factors Society-Alamo Chapter-Symposium on Human Factors and Ergonomics*, San Antonio, TX.
- Helmreich, R.L., Sawin, L.L., & Carsrud, A.L. (1986). The honeymoon effect in job performance: Delayed predictive power of achievement motivation. *Journal of Applied Psychology*, 71, 185-188.
- Pred, R.S., Spence, J.T., & Helmreich, R.L. (1986). The development of new scales for the Jenkins Activity Survey Measure of the Type A construct. *Social and Behavioral Science Documents*, 16, 51-52, MS #2769.
- Helmreich, R. L. (1987). Theory underlying CRM training: Psychological issues in flightcrew performance and crew coordination. In H. W. Orlady & H.C. Foushee (Eds.), *Cockpit resource management training: Proceedings of the NASA/MAC Workshop*. NASA-Ames Research Center: CP-2455.
- Helmreich, R.L., & Wilhelm, J.A. (1987). Evaluating cockpit resource management training. *Proceedings of the Fourth Aviation Psychology Symposium*, Ohio State University, 440-446.
- Helmreich, R.L. (1987). Exploring flight crew behaviour. *Social Behaviour*, 2, 63-72.
- Helmreich, R.L. (1987). Psychology in space. *Discovery*, 10, 38-42.
- Spence, J.T., Helmreich, R.L., & Pred, R.S. (1987). Impatience versus achievement strivings in the Type A pattern: Differential effects on students' health and academic achievement. *Journal of Applied Psychology*, 72, 522-528.
- Helmreich, R. L. (1987). Living in contained environments: Research implications from undersea habitats. In H. Ursano (Ed.), *Individual and group behavior in toxic and contained environments: Proceedings of the conference*. Washington: Uniformed Services University of the Health Sciences.
- Hackman, J.R., & Helmreich, R.L. (1987). Assessing the behavior and performance of teams in organizations: The case of air transport crews. In D.R. Peterson & D.B. Fishman (Eds.), *Assessment for Decision*. New Brunswick, NJ: Rutgers University Press.

- Helmreich, R.L., Wilhelm, J.A., & Foushee, H.C. (1988). Astronaut and aquanaut performance and adjustment behavioral issues in analogous environments. *Proceedings of the 18th Intersociety Conference on Environmental Systems*. San Francisco, CA, July 11-13, 1988.
- Foushee, H.C., & Helmreich, R.L. (1988). Group interaction and flight crew performance. In E.L. Wiener & D.C. Nagel (Eds.), *Human Factors in Aviation*, (pp. 189-227), Academic Press.
- Helmreich, R. L., Spence, J. T., & Pred, R. S. (1988). Making it without losing it: Type A, achievement motivation, and scientific attainment revisited. *Personality and Social Psychology Bulletin*, 14, 495-504.
- Spence, J.T., Pred, R.S., & Helmreich, R.L. (1989). Achievement strivings, scholastic aptitude, and academic performance: A follow-up to "Impatience versus achievement strivings in the Type A pattern." *Journal of Applied Psychology*, 74, 176-178.
- Helmreich, R.L., & Wilhelm, J.A. (1989). When training boomerangs: Negative outcomes associated with Cockpit Resource Management Programs. In R.S. Jensen (Ed.), *Proceedings of the Fifth International Symposium on Aviation Psychology*, 1, 692-697. Columbus, OH: Ohio State University.
- Gibson, R.H., & Wilhelm, J.A. (1989). Managerial Leadership Assessment: Personality correlates of and sex differences in ratings by leaders, peers and followers. In R.S. Jensen (Ed.), *Proceedings of the Fifth International Symposium on Aviation Psychology*, 1, 682-685. Columbus, OH: Ohio State University.
- Gregorich, S., Helmreich, R.L., & Wilhelm, J.A. (1989). Personality based clusters as predictors of aviator attitudes and performance. In R.S. Jensen (Ed.), *Proceedings of the Fifth International Symposium on Aviation Psychology*, 1, 686-691. Columbus, OH: Ohio State University.
- Helmreich, R.L., Chidester, T.C., Foushee, H.C., Gregorich, S., & Wilhelm, J.A. (1990). How effective is Cockpit Resource Management training? Issues in evaluating the impact of programs to enhance crew coordination. *Flight Safety Digest*, 9(5), 1-17.
- Helmreich, R.L., Wilhelm, J.A., Gregorich, S., & Chidester, T.R. (1990). Preliminary results from the evaluation of Cockpit Resource Management training: Performance ratings of flight crews. Paper originally presented at NASA/Pan American LOFT Conference, Miami, FL, July 20-21, 1989. *Aviation Space and Environmental Medicine*, 61(6), 576-579.
- Gregorich, S.E., Helmreich, R.L., & Wilhelm, J.A. (1990). The structure of Cockpit Management Attitudes. *Journal of Applied Psychology*, 75(6), 682-690.
- Chidester, T.R., Helmreich, R.L., Gregorich, S.E., & Geis, C.E. (1990). Pilot personality and crew coordination: Implications for training and selection. *International Journal of Aviation Psychology*, 1, 23-42.
- Helmreich, R.L., & Wilhelm, J.A. (1991). Outcomes of Crew Resource Management training. *International Journal of Aviation Psychology*, 1(4), 287-300.
- Helmreich, R.L., & Wilhelm, J.A. (1991). Determinants of flightcrew performance. In *Proceedings of the International Civil Aviation Organization Human Factors Seminar*, 276-286. Leningrad, USSR.
- Helmreich, R.L. (1991). The long and short term impact of Crew Resource Management Training. In *Proceedings of the AIAA/NASA/FAA/HFS Conference Challenges in Aviation Human Factors: The National Plan*, (pp. 81-83). Vienna, VA: American Institute of Aeronautics and Astronautics, Inc.

- Helmreich, R.L. (1991). Strategies for the study of flightcrew behavior. In R.L. Jensen (Ed.), *Proceedings of the Sixth International Symposium on Aviation Psychology* (pp. 338-343). Columbus, OH: The Ohio State University.
- Butler, R.E. (1991). Lessons from cross-fleet/cross-airline observations: Evaluating the impact of CRM/LOFT training. In R.L. Jensen (Ed.), *Proceedings of the Sixth International Symposium on Aviation Psychology* (pp. 326-331). Columbus, OH: The Ohio State University.
- Clothier, C.C. (1991). Behavioral interactions across various aircraft types: Results of systematic observations of line operations and simulations. In R.L. Jensen (Ed.), *Proceedings of the Sixth International Symposium on Aviation Psychology* (pp. 332-337). Columbus, OH: The Ohio State University.
- Irwin, C. (1991). The impact of initial and recurrent Cockpit Resource Management training on attitudes. In R.L. Jensen (Ed.), *Proceedings of the Sixth International Symposium on Aviation Psychology* (pp. 3344-349). Columbus, OH: The Ohio State University.
- Predmore, S.C. (1991). Microcoding of communications in accident investigation: Crew coordination in United Flight 811 and United 232. In R.L. Jensen (Ed.), *Proceedings of the Sixth International Symposium on Aviation Psychology* (pp. 3350-355). Columbus, OH: The Ohio State University.
- Wilhelm, J.A. (1991). Crew member and instructor evaluations of Line Oriented Flight Training. In R.L. Jensen (Ed.), *Proceedings of the Sixth International Symposium on Aviation Psychology* (pp. 362-367). Columbus, OH: The Ohio State University.
- Helmreich, R.L. (1992). Human factors aspects of the Air Ontario crash at Dryden, Ontario: Analysis and recommendations. In V.P. Moshansky (Commissioner), *Commission of Inquiry into the Air Ontario Accident at Dryden, Ontario: Final report. Technical appendices*. (pp. 319-348). Toronto, Ontario: Minister of Supply and Services, Canada.
- Helmreich, R.L., & Foushee, H.C. (1993). Why Crew Resource Management? Empirical and theoretical bases of human factors training in aviation. In E. Wiener, B. Kanki, & R. Helmreich (Eds.), *Cockpit Resource Management* (pp. 3-45). San Diego, CA: Academic Press.
- Butler, R. E. (1993). LOFT: Full mission simulation as Crew Resource Management training. In E. Wiener, B. Kanki, & R. Helmreich (Eds.), *Cockpit Resource Management* (pp. 231-259). San Diego, CA: Academic Press.
- Helmreich, R.L., Wiener, E., & Kanki, B.G. (1993). The future of Crew Resource Management in the cockpit and elsewhere. In E. Wiener, B. Kanki, & R. Helmreich (Eds.), *Cockpit Resource Management* (pp. 479-501). San Diego, CA: Academic Press.
- Law, J.R., & McFadden, T.J. (1992). Training and evaluating team process skills in the commercial aviation environment. In *Proceedings of the Human Factors Society 36th Annual Meeting*, 1346-1350.
- Helmreich, R. L. (1993). Fifteen years of the CRM wars: A report from the trenches. In *Proceedings of the Australian Psychology Symposium* (pp. 73-87). Sydney, Australia: The Australian Aviation Psychology Association.
- Gregorich, S. E., & Wilhelm, J. A. (1993). Crew Resource Management training assessment. In E. Wiener, B. Kanki, & R. Helmreich (Eds.), *Cockpit Resource Management* (pp. 173-198). San Diego, CA: Academic Press.

- Helmreich, R.L. (1993). Whither CRM? Future directions in Crew Resource Management training in the cockpit and elsewhere. In R.S. Jensen (Ed.), *Proceedings of the Seventh International Symposium on Aviation Psychology* (pp. 543-548). Columbus, OH: Ohio State University.
- Merritt, A.C. (1993). Cross-cultural attitudes of flight crew regarding CRM. In R.S. Jensen (Ed.), *Proceedings of the Seventh International Symposium on Aviation Psychology* (pp. 5561-5566). Columbus, OH: Ohio State University.
- Jones, S.G. (1993). Human factors in incident reporting. In R.S. Jensen (Ed.), *Proceedings of the Seventh International Symposium on Aviation Psychology* (pp. 567-572). Columbus, OH: Ohio State University.
- Helmreich, R. L. (1994). Anatomy of a system accident: The crash of Avianca Flight 052. *International Journal of Aviation Psychology*, 4(3), 265-284.
- Helmreich, R. (1994). Future directions in Crew Resource Management training. *International Civil Aviation Organization (ICAO) Journal*, 48(7), 8-9.
- Schaefer, H.-G., & Helmreich, R. L. (1994). The importance of human factors in the operating room. *Anesthesiology*, 80(2), 479-482.
- Law, J. R., & Wilhelm, J. A. (1994). Captain's and First Officers' spheres of influence. *The CRM Advocate*, 94-1, 16-18.
- Merritt, A. C. (1994). Cross-cultural issues in CRM training. In *Proceedings of the Sixth ICAO Flight Safety and Human Factors Regional Seminar and Workshop* (pp. 236-243). Amsterdam, The Netherlands, May 17-19, 1994. Also in *Airline Pilot*, 64(5), 32-35.
- Helmreich, R. L., & Schaefer, H.-G. (1994). Team performance in the operating room. In M.S. Bogner (Ed.), *Human Error in Medicine* (pp. 225-253). Hillsdale, NJ: Lawrence Erlbaum and Associates.
- Helmreich, R.L. (1994). Flightcrew perspectives on automation: A cross-cultural perspective. In *Proceedings of the Sixth ICAO Flight Safety and Human Factors Regional Seminar and Workshop* (pp. 367-378). Amsterdam, The Netherlands, May 17-19, 1994.
- Rose, R.M., Fogg, L.F., Helmreich, R.L., & McFadden, T.J. (1994). Psychological predictors of astronaut effectiveness. *Aviation Space and Environmental Medicine*, 65, 910-915.
- Schaefer, H.-G., Helmreich, R.L., & Scheidegger, D. (1994). Human factors and safety in emergency medicine. *Resuscitation*, 28, 221-225.
- Sherman, P.J., & Wiener, E.L. (1995). At the intersection of automation and culture. *Earth Space Review*, 4(1), 11-13.
- Merritt, A. (1995, May). Cross-cultural issues in CRM training. *Airline Pilot*, pp. 32-35.
- Helmreich, R., & Taggart, W. (1995). CRM: Where are we today? In *Proceedings of the CRM Industry Update Workshop*. Seattle, WA, September 12-13, 1995.
- Helmreich, R.L. (1995). Organizational and national culture: Their influence on organizational climate and human factors. In *Proceedings of the ICAO Asia and Pacific Region First Regional Human Factors Training Seminar*, 33-47. Hong Kong, China, September 4-6, 1995.
- Merritt, A.C. (1995). Facing the issue. *The CRM Advocate*, 95-4, 1-7.

- Taggart, W.R. (in press). The NASA/UT/FAA Line/LOS checklist: Assessing system safety and crew performance. In *Proceedings of the Eighth International Symposium on Aviation Psychology*. Columbus, OH: Ohio State University.
- Merritt, A.C., & Helmreich, R.L. (in press). Culture in the cockpit: A multi-airline study of pilot attitudes and values. In *Proceedings of the Eighth International Symposium on Aviation Psychology*. Columbus, OH: Ohio State University.
- Sherman, P.J., & Helmreich, R.L. (in press). Attitudes toward automation: The effect of national culture. In *Proceedings of the Eighth International Symposium on Aviation Psychology*. Columbus, OH: Ohio State University.
- Law, J.R., & Sherman, P.J. (in press). Do raters agree? Assessing inter-rater agreement in the evaluation of air Crew Resource Management skills. In *Proceedings of the Eighth International Symposium on Aviation Psychology*. Columbus, OH: Ohio State University.
- Merritt, A.C. (1995). Commercial pilot selection and training: Some global cultural considerations. In *Proceedings of the Human Factors Group of the Royal Aeronautical Society Conference*, London, England, October 12, 1995.
- Helmreich, R. L. (in press). Group dynamics and human factors on the flightdeck. *International Civil Aviation Organization (ICAO) Journal*.
- Merritt, A.C., & Helmreich, R.L. (in press). CRM in 1995: Where to from here? In *Proceedings of the Third Australian Aviation Psychology Symposium*, Sydney, November 20-24, 1995.
- Merritt, A.C., & Helmreich, R.L. (in press). Creating and sustaining a safety culture: Some practical strategies. In *Proceedings of the Third Australian Aviation Psychology Symposium*, Sydney, November 20-24, 1995.
- Sherman, P.J., & Helmreich, R.L. (1996). National cultural differences in attitudes toward and preference for automation in aviation. Submitted to *Journal of Applied Psychology*.

Appendix B: Technical Papers and Invited Addresses Resulting from NASA Cooperative Agreement NCC2-286

- Helmreich, R.L. Social psychological research in NASA: History, status, prospects. Paper presented at the Annual Convention of the American Psychological Association, Washington, D.C., 1986.
- Helmreich, R.L. Studying flightcrew behavior: A social psychologist encounters the real world. Paper presented at the annual convention of the American Psychological Association, Washington, D.C., 1986.
- Helmreich, R.L., & Wilhelm, J.A. Reinforcing and measuring flightcrew resource management: Training Captain/Check Airman/Instructor Reference Manual. NASA/The University of Texas at Austin Technical Manual 87-1. Revised 4/15/88.
- Helmreich, R.L., & Wilhelm, J.A. Human performance in aerospace environments: The search for psychological determinants. Paper presented at the NASA Life Sciences Symposium, Washington, D.C., June 23, 1987.
- Helmreich, R.L. The critical role of personality and organizational factors as determinants of reactions to restricted and stressful environments. Invited lecture to the Third International Conference on Rest. New York, August 28, 1987.
- Helmreich, R.L. Personality and organizational influences on aerospace and human performance. Paper presented at 34th Annual Symposium of the American Astronautical Society, Houston, November 5, 1987.
- Helmreich, R.L., Wilhelm, J.A., & Gregorich, S.E. Revised versions of the Cockpit Management Attitudes Questionnaire (CMAQ) and CRM Seminar Evaluation Form. NASA/UT Technical Report 88-3.
- Helmreich, R.L., Chidester, T.R., Foushee, H.C., Gregorich, S., & Wilhelm, J.A. (1989). Critical issues in implementing and reinforcing Cockpit Resource Management training. NASA/University of Texas Technical Report 89-5.
- Helmreich, R.L., Kello, J.E., Chidester, T.R., Wilhelm, J.A., & Gregorich, S.E. (1989). Maximizing the operational impact of Line Oriented Flight Training (LOFT): Lessons from initial observations. NASA/University of Texas Technical Report 89-6.
- Helmreich, R.L. Studying flightcrew interaction: The intersection of basic and applied research. Talk presented at the dedication of NASA-Ames Research Center Human Performance Laboratory, April 11, 1990.
- Helmreich, R.L., Holland, A.W., McFadden, T.J., Rose, R.M., & Santy, P.A. (1990). Strategies for crew selection for long duration missions. Paper presented at the AIAA Space Programs and Technologies Conference, Huntsville, AL, September 25-28, 1990.
- Helmreich, Robert L., Merritt, Ashleigh C., Sherman, Paul J., Gregorich, Steven E., & Wiener, Earl L. (1993). The Flight Management Attitudes Questionnaire (FMAQ). NASA/UT/FAA Technical Report 93-4.
- Merritt, Ashleigh (1993). What our Cross-Cultural studies have taught us about CRM. Talk presented at the 3rd Annual Industry CRM Workshop, Atlanta, GA, July, 1993.

- Merritt, Ashleigh (1994). Cultural aspects of CRM in mono- and multi-cultural airlines. NASA/UT/FAA Technical Report 94-03. Talk presented at the Shell Aircraft Ltd. Aviation Safety Course, London, England, September, 1994.
- Helmreich, R.L. (1995). Current issues in human factors, performance assessment, and safety. Talk presented at the Air Transport Association Training Committee Meeting and the AQP Focus Group Chairmen, Washington, DC, January 9, 1995.
- Helmreich, R.L. (1995). Real world payback from space human factors research. Paper presented at the 1995 AIAA Human Factors Symposium, Houston, Texas, April 3, 1995.
- Merritt, A.C. (1995). Designing culturally sensitive CRM training: CRM in China. Paper presented at the Training and Safety Symposium in Guangzhou, P.R.C., May, 1995.
- Merritt, A.C. (1995). Culture in the cockpit - National, organizational, and occupational influences. Talk presented at the Human Factors Group of the Royal Aeronautical Society, London, England, October 12, 1995.
- Helmreich, R.L. Human factors training to enhance performance. *Transportation Research Board Conference*, Washington, DC, January, 1994.
- Helmreich, R.L. Selection and group dynamics. *European Space Agency, Space Psychology Days*, Avignon, France, April, 1994.
- Helmreich, R.L. Life sciences research needs in spaceflight. *Aerospace Medical Association Annual Convention*, San Antonio, May, 1994.
- Merritt, A.C. Cultural aspects of CRM in mono- and multi-cultural airlines. Talk presented at the *Shell Aircraft Ltd. Aviation Safety Course*, London, England, September, 1994.
- Helmreich, R.L. Human factors in aviation. *International Civil Aeronautics Organization Human Factors Conference*, Addis Ababa, Ethiopia, November, 1994.
- Helmreich, R.L. Current issues in human factors, performance assessment, and safety. Talk presented at the *Air Transport Association Training Committee Meeting*, Washington, DC, January 9, 1995.
- Merritt, A. Cross-cultural issues in CRM/LOFT training. Paper presented at the *International Air Transport Association Human Factors in Aviation Seminar*, Bahrain, March 7, 1995.
- Helmreich, R.L. Human factors training. United Arab Emirates, Dubai, March, 1995.
- Helmreich, R.L. Human factors of cockpit management. *International Air Transport Association*, Bahrain, March, 1995.
- Helmreich, R.L. Real world payback from space human factors research. Paper presented at the 1995 *AIAA Human Factors Symposium*, Houston, Texas, April 3, 1995.
- Merritt, A.C. Designing culturally sensitive CRM training: CRM in China. Paper presented at the *Training and Safety Symposium*, Guangzhou, P.R.C., May, 1995.

**Appendix C: Dissertations and Theses
Resulting from NASA Cooperative Agreement NCC2-286**

February 1, 1984 through June 30, 1995

- Chidester, T.R. (1986). Mood, sleep, and fatigue effects in flight operations. Unpublished doctoral dissertation. The University of Texas at Austin.
- Siem, F.W. (1987). The effects of aircrew member personality on interaction and performance. Unpublished doctoral dissertation. The University of Texas at Austin.
- Gibson, R.H. (1988). Managerial leadership assessment: Personality correlates of and sex differences in ratings by leaders, peers, and followers. Unpublished doctoral dissertation. The University of Texas at Austin.
- Clothier, K. (1991). Cockpit resource management: Effects on behavioral interactions across airlines and aircraft types. Unpublished masters' thesis. The University of Texas at Austin.
- Gregorich, S (1991). Individual differences, scientific performance, and professional affiliations in the early scientific career. Unpublished doctoral dissertation. The University of Texas at Austin.
- Irwin, C. (1991). The impact of training on cockpit management attitudes. Unpublished masters' thesis. The University of Texas at Austin.
- Roberts, D. (1991). In search of Florence Nightingale: A multivariate look at personality traits, job reactions, and burnout in nurses. Unpublished doctoral dissertation. The University of Texas at Austin.
- Predmore, S (1992). The dynamics of group performance: A multiple case study of effective and ineffective flightcrew performance. Unpublished doctoral dissertation. The University of Texas at Austin.